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ABSTRACT

The report describes a program directed toward the full integration of students with learning disabilities (LD) into the regular academic program of the University of Colorado at Boulder. The program features a diagnostic prescriptive model in which results of formal and informal testing are shared with students to help them develop an understanding of their learning profile. Prescriptive activities are then derived from test results, emphasizing the change from passive to active learning styles and the importance of the students' responsibility for their own learning. The diagnostic process uses error analysis and examination of learning styles, and formal testing helps the students become aware of strengths and weaknesses. A case study illustrating a student with possible deficits in auditory processing reveals how results of formal testing are used to help the student become aware of his strengths in deductive reasoning and weaknesses in short-term memory. The prescriptive phase builds upon awareness of self, of task, and of the professor. An example is provided of a student who learned to recontextualize what she had read and to develop better retrieval strategies. Evaluation of the program's results was performed on 55 students (35 students who participated in all phases of the program and 20 students who were diagnosed but did not choose to participate in prescriptive activities). (CL)

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A NEW APPROACH TO LEARNING DISABILITY PROGRAMS IN POST-SECONDARY EDUCATION

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A New Approach to Learning Disability Programs in Post - Secondary Education

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1. The Problem:

The problem with which the UCB program began can be stated as follows: If learning disabled students become conscious of their learning deficits, can they develop the personal control over their learning processes that will allow them to become effective learners at the college level? Can an approach that emphasizes "learning to learn" replace a mechanical approach directed toward overcoming auditory or visual coding deficits?

2. Procedures:

Procedures are constructed around a diagnostic perscriptive model. The diagnostic process includes informal and formal testing. The key to the process is the sharing with the student of testing results. The interpretation of these results to the student assists the student in developing an understanding of his/her learning profile. Perscriptive activities are then derived from test results. An emphasis is placed on the student

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language mechanics are taught. The approach is meta cognitional; it emphasizes a linguistic approach and it stresses the need for the student to take ownership for her/his own learning.

3. The Diagnostic Process

As soon as an appointment is made for diagnostic-prescriptive testing, the examiner and student interact to begin their intense meta cognitive search to build self awareness of "learning to learn." A differential diagnosis, divided into informal and formal assessment, becomes the "mediator" between the examiner and student, as awareness of the cognitive strengths grow and the identification of the sensory perceptual deficiencies that constitute a learning disability are discussed and interpreted in a step-by-step process.

Informal testing begins with discussion and a written diagnostic interview, administered with open-ended questions to be answered in writing. The process allows the student to express learning concerns and encourages "self interrogation"[1] of one's past history and present performance. The written form allows the examiner to determine discrepancies between oral and written language, and to ask questions relevant to the diagnosis. The questioning technique makes a passive testing process active. The student is asked to reflect on her/his "internal dialogue." The student must learn to continually ask: "What interferes with my learning? What can I do to improve learning?" The examiner, on the other hand, must ask, "What do I need to know about this student to be of assistance? How can I develop a diagnosis which will develop self awareness for strategy planning?" Working together in an interactive exchange, both the examiner and student become responsible for finding answers. In this way a test becomes a "self acknowledging process," and a basis of self under-

standing is created which will allow the student to become a carrier of information to faculty and staff concerning his/her own special learning needs.

To start the written process, questions are carefully formulated to elevate a student's self esteem and sense of cognitive maturity. For example, a question might be "From observation and conversation you seem intellectually strong. Why did you come to see me?" This question establishes the student's ability to answer a question and affirms his decision to seek help. One student wrote "alth-uh- I may be intellectually strong I ----- problem - ----- are restra-ing me form my ful patent-al. I have problem--- with studding and organ-z ashun." [Although I may be intellectually strong, I have problems that are restraining me from my full potential. I have problems with studying and organization.] From this small sampling I could predict a deficit in auditory memory. Some students write about transposing numbers and letters. Others write about losing information when reading an assignment or when taking notes during lectures. Expressions such as "It is difficult to trust what I see," "Have never been taught to learn--think things out," "I have it in my head but can't write it," and "I only write words I can spell" are prevalent.

In response to the student's written answer it is important to "echo" and repeat phrases that acknowledge the student's own expression of deficit and learned helplessness. From this sample cluster of concerns, the examiner may write or say, "You are most perceptive and aware of your own learning interference. I am beginning to observe in your writing 'something' which affects your ability to discriminate, hold and sequence letters, words, and sentences. However, you show a strong ability to communicate orally." This process begins to build an awareness on the part of the

student that he or she is capable of self assessment and direct communication with others; and therefore can be an active participant in assisting the examiner in diagnostic observation and prescriptive follow-through. Specifically, in response to the student who shared spelling concerns, the examiner may ask, "Why is spelling such a problem?" As the student expresses his/her frustrations about spelling, this opens new self awareness, when the examiner says, "Spelling has a great deal to do with accurate auditory and visual input and holding sounds and letters in order." At this point a simple bar chart is constructed into three parts to show relationships and simultaneous interactions between auditory and visual input, perception and cognitive memory and output and expression.

The student is shown that the residue of even one undetected sensory deficiency in receiving, integrating and expressing information can affect output in speaking and writing. The concepts of phonemic graphemic input, syntactic integration and semantic understanding are lightly introduced. At this point, the examiner needs to work through with the student "self acknowledgment" of modality strength, to make hypothesis more meaningful and to insure that the student acknowledges his/her deficits . A question might be, "Do you believe you are an auditory or visual learner?" A student's response was, "I have a tendency to learn visually, but only after repetition." This tells the examiner three things: (1) the student has developed visual comprehension, (2) the student is not sure of how an auditory deficit affects learning, and (3) the student needs repetition to remember.

As soon as the student answers a question, error analysis begins. The student is asked to read her/his written answer, while the examiner corrects. This process allows the examiner to evaluate the student's reading ability and allows the student to begin a self monitoring process. In this

way the student is able to see the discrepancy between conceptual intent and orthographic representation. Interactively the examiner and student analyze written formulation, always asking what the pattern of error represents. From the sampling of writing the student and examiner interact to find these errors:

1. the omission of verbs
2. the omission of suffix position
3. the reversal of letters in spelling and omission of syllables
4. the omission of punctuation
5. the omission of function words that signal syntactical structure.

The word omission is repeated to signal to the student that information is missing, and therefore we need to look at memory processes. The student is asked to reflect upon the following questions: Are you not hearing distinct sounds and grammatical signals? Are you not seeing distinct symbols? Are you not connecting sounds and symbols? Are you not recalling in sequence? As a result of working through the process the student understands that she/he could have a perceptual deficit.

From time to time throughout the diagnosis the examiner should ask a question which emphasizes the student's strength. Most students have found that there has been a preoccupation with their failings rather than their successes throughout their education. The process by which self esteem is developed needs to begin at this early point in our relationship with the student. In exchange of dialogue, either verbal or written, the student's strengths in thinking, evaluating, synthesizing and building relationships are identified and acknowledged. To the student who wrote, "Never been taught to learn--and think things out," a response might be: "You have used a negative strategy of blaming the educational system for your learning

difficulty. You really can think!" Now let us use this strength to develop positive learning strategies. The examiner touches lightly upon some of the causes of the student's learning difficulties. Specific terminology is introduced to assist the student to label and make associations concerning his/her learning profile. We are now ready to formulate our first hypothesis. The hypothesis provides guidance to us as we move to formal testing.

4. Formal Testing

The purpose of formal testing is to further test and modify our initial hypothesis and to assist the student to become consciously aware of strengths and weaknesses. The student participates in a formal testing process based on a discrepancy psycho-educational model. A developmental hierarchy much like task analysis is developed. We start with a simple non-verbal visual motor test, and move to a more complex assessment of linguistic processes which aids us in providing cognitive interpretations. We demonstrate to the student that "systems of intelligence used for presenting information--perception and association memory"[2]--interact and affect learning but are not pervasive and dominant. The hypothesis that an interaction exists between sensory perceptual processing, linguistic processing and cognitive semantic processing[3] gives rationale to test selection, interpretation and development of strategy. Through testing, which moves from lower levels of representational processing to higher levels of comprehension and thinking, involving syntactic-semantic relationships, the student is assisted to develop a greater readiness for use of efficient strategies for learning.

To demonstrate this developmental process, we will follow and interact with Mike, whose informal writing was cited. We formulated hypotheses

which suggested that Mike was cognitively strong, and that he showed a pattern of error in written formulation which may be attributed to a possible deficit in auditory processing. As Mike became comfortable with the testing process he was able to accept that the identification of a deficit was not equivalent to a self fulfilling prophecy that would result in failure. He looked forward to the challenge of "unmasking" his learning disability. During testing Mike was curious and motivated. Informality existed during formal testing. Often, the pace of intense testing was changed by asking questions about test results, in informal conversation, or in utilizing the written question and answer format.

a. The Bender Visual Motor Gestalt Test was chosen as the first test to assess Mike's ability to problem solve, and to assess his hand-eye movement as he perceived and copied geometric forms. His output in performance showed intact psycho-motor functioning which eliminated dysgraphia or execution of motor patterns as a reason for deficiency in written expression. He approached the task strategically, by first getting an overview, touching stimuli, and then working step-by-step to reproduce a whole. Three observations were noted: (1) Mike was a tactile learner using touch and gestures to process information, (2) he internalized and organized information prior to performance, and (3) his over-attention to detail was an important observation to follow through in testing.

b. To continue with a visual assessment, the Visual Matching Subtest of the Woodcock Johnson Tests of Cognitive Ability was chosen. This receptive assessment evaluated Mike's ability to discriminate and select among numbers alike in configuration. It is a timed test, and shows tracking and eye movement in left-right directionality. Mike showed quick accuracy in visual decision and control of eye movements across a page. He showed no visual regressions or omissions. If Mike was found to be phonic bound in

further testing, he could use this visual strength to segment words and phrases into meaningful units, without visual interference.

c. The next test given was the decoding test of the Wide Range Achievement Test (WRAT). We wanted to observe the process Mike used to break the phonetic and visual code, as he recognized words. This test was given to show Mike that naming words involved task recognition, not task cognition. Mike functioned below college level on this test, showing an inadequate ability for synthesis and retrieval of phonetic associations. It was apparent that he depended upon sight vocabulary and the meaning he associated with the word. In decoding, Mike showed the following pattern of error: (1) Inability to hold a sequence, resulting in reversed phonemes. He called sepulcher "spelucher," egregious "eregious." (2) Omission of medial syllable. He called covetousness "covet.less", ingratiating "ingra.tion." (3) Omission of suffix position. He called protuberance "protuber---," irascible "irasc---." These errors were consistent with those identified during formal testing. Therefore we expanded our hypothesis that Mike attended to details of phonemic information rather than meaning. With this hypothesis in place, we can move to further testing. Three auditory measures will be discussed: synthesis or sound blending, auditory discrimination, and auditory memory span. If Mike demonstrated a deficit in the areas assessed by these tests, then we can assume that he is fixating on narrow details; and thus not synthesizing auditory information into structures of larger meaning.

d. The Blending Test of the Woodcock Johnson Tests of Cognitive Ability was chosen to test if Mike could listen to isolated syllables with a time delay between each syllable and produce the whole word. The process involved holding each syllable in short-term memory until all had been

presented. For example, l ea f, e lec tric, tel e vis ion. Mike showed significant difficulty with this task, indicating that his low score in decoding was at the phonological level.

e. We now move to auditory discrimination and figure background analysis. The Goldman Fristoe Test of Auditory Discrimination was administered to determine Mike's ability to choose among phonemes under quiet and noisy environmental conditions. The results of this test allowed the examiner to conclude that Mike would have difficulty accurately identifying auditory information, when he found himself in situations where he was required to select from a field of competing stimuli. In addition, the examiner could further hypothesize that Mike would have difficulty in distinguishing and retrieving specific phonemes; thus forming unstable sound associations in listening. A review of data gathering during informal testing can now be better interpreted. We now see why Mike had difficulty processing vowels embedded in a word or words embedded in a sentence.

f. The Auditory Attention Span for Unrelated Words, a subtest of the Detroit Test of Learning Aptitude was administered as the third dimension of auditory processing to evaluate Mike's short-term immediate memory processes in receiving, sequencing and retrieving unrelated words. As could be predicted, performance on this test was significantly low. Mike could only repeat up to four words without error. This test was given to show Mike that dependence upon surface auditory information reinforced his deficit in rote learning, but words in context reinforced semantic-syntactic relationships to assist short-term memory.

g. Next we administered the Spelling Subtest of the WRAT which involved intersensory-cross modality integrity. In this task Mike transduced patterns of sound and symbols from one modality to another, while simultaneously executing psycho motor sequences to produce a graphic representa-

tion. In the decoding assessment, a test of recognition, there were phonetic, structural, and configuration cues to jog memory. However, in spelling, a task of recall, there were no cues. There was a discrepancy of six years between Mike's performance in decoding and his lower performance in spelling. Besides errors relating to deficient auditory processing, errors showed what Johnson and Myklebust called a revisualization deficit in re-seeing the image of letters in order. Examples of this would be phonetic spelling of non-phonetic words such as "preasous" for precious, "physion" for physician, or "sovernty" for sovereignty. Mike could not convert the auditory equivalent to its visual counterpart in intersensory processing, which further developed our hypothesis.

h. To confirm a revisualization deficit, as represented in spelling, the Detroit Test of Visual Attention Span for letters was administered. Testing showed Mike could not store and recall more than five unrelated letters in sequence without error. As Mike became aware of his deficit in short-term auditory memory, and his deficit in short-term visual memory span, a message became apparent to him that in order to improve his store of retrievable vocabulary he needed to build meaning. The method of analyzing the formation of words through meaningful linguistic morphological units rather than sounds and letters was recommended. Chomsky and Halle have shown that English "orthography is more closely related to morphology than the sound system."[4] Multi-syllable words, difficult to decode and spell, could be changed into units of meaning rather than discrete phonemic graphemic elements. For example, a word root like pathy, meaning feeling, could be combined with sym, meaning together, to give the connotation of sympathy, which semantically means feeling together. From the root word "pathy," other words such as empathy, apathy, and pathology

could be developed, thus increasing conceptual chunking for word recognition, spelling, and vocabulary retrieval.

At this point in testing we needed to reflect and incorporate meta cognitive "self awareness" by summarizing what testing revealed. We have tested on the representational "surface" level by identifying phonemic graphemic inconsistencies in Mike's profile of learning. We have used what Rosner calls testing for "code emphasis" rather than cognitive emphasis. We have used tests to assess surface structure rather than semantic deep structure. We are now ready to shift testing emphasis from the level of phonemic graphemic awareness to the cognitive semantic-syntactic level of language acquisition and processing. We shared with Mike this statement, "We recode what is in memory in accordance with our greater cognitive maturity,"[5] and discussed its meaning as we prepared for the next group of tests.

i. We began this area of testing with the Peabody Picture Vocabulary Test, a cognitive measure which assessed knowledge of the meaning of words and concepts as well as their broad general meanings. In this test Mike was asked to integrate auditory input with pictures to make a cognitive association of the meaning of a word and select a correct choice. As predicted, Mike showed strong functioning. It was interesting to note that Mike "talked to himself" as he problem-solved to reach a decision. We reminded Mike of his problem-solving ability on the Bender Gestalt and just then the test results became a more meaningful whole.

j. Next the DTLA Verbal Opposites Test, was administered auditorially to show Mike that if he could adequately produce analogous thinking in retrieving and formulating an antonym he could use this cognitive skill to retrieve thought processes for comprehension. Observation of how he reached solutions was interesting. Mike had difficulty in producing a

specific label in response to the presented stimuli. He showed dynomia "word finding" difficulty. Mike said, "I get so frustrated. I know what I want to say, but don't know the word." To reach a solution Mike paraphrased, circumlocuted and used body and hand gestures to cue decisions. For example, in naming the opposite of the word "expand" he began to move his hands out and then verbalized by moving his hands together, to retrieve the word "contract." This was Mike's approach to develop a self generated response. In the 1975 research of Wiig and Semel they reported that adolescents with a learning disability show a deficit in both speed and accuracy with which they recall verbal opposites.[6]

k. Mike's self awareness of his ability to conceptualize was confirmed after he saw the results of the DTLA Test of Likeness and Differences. In this test he was asked to give a determining characteristic of two words, ranging from easy concrete words like knife and saw, to more morphological interpretation like synonym and antonym. In analyzing the difference between knife and saw, Mike gestured and closed his eyes to visualize the mental image and then answered. This kinesthetic approach, combined with the application of visual imagery was used frequently by Mike to mediate decisions. In this test Mike did not have to evoke a label or retrieve a specific word. He was able to express in context the relationship of words to ideas. As Mike conceptualized, it became more apparent that Mike's attending to detail was fear of error. The hypothesis was drawn that he was basically a top down detective learner drawing from gestalt conceptualization. Sharing this hypothesis with Mike has helped him to develop the self confidence he needs in order to control his own learning.

l. We now come to the conclusion of testing which brings us back

again to the hypothesis developed in informal testing that Mike's inability to synthesize phonics and formulate syntactically correct sentences generates from an auditory short-term memory deficit. Johnson and Myklebust suggest that the learning disabled child is not able to retain the linguistic structure of sentences he hears. As a result he does not have the linguistic patterns necessary to generate appropriately ordered sentences.[7] The next test, the Woodcock Johnson Battery: Tests of Cognitive Ability, Memory for Sentences, was chosen to share with Mike his control of syntactic structure. In repeating a string of sentences, Mike's errors were equivalent to the pattern of omission prevalent throughout testing. Instructions stated to repeat the string of sentences exactly. Mike was able to select the subject and verb, in an actor and action relationship, but paraphrased and lost syntactical accuracy when the sentence length was beyond short-term memory capacity. He omitted adjectives, verb inflections and grammatical markers that signaled embedded information, such as who, what, that, in relative clauses and to, from, along in prepositional phrases. In most cases, Mike could not route syntactic complexity to short-term memory for accurate retrieval. He used deep structure from long-term memory to successfully paraphrase. As we assess Mike's performance it is interesting to note that Kohler in 1972 indicated that syntactic complexity "reflects limitations in short-term memory, and deep structure and semantic interpretation, represented in long term memory appeared to facilitate auditory processing and recall."[8] It was clear that Mike developed interest and intent to understand and learn syntactical and morphological cueing "to provide structure and signals that segment, modify and tune language,"[9] to improve his reading, writing and spelling.

Reading Comprehension was chosen to complete the battery of tests to reflect upon and confirm the results of test interpretation and diagnostic

prescription. Three tests were chosen: the Woodcock Johnson Reading Comprehension Test to assess ability to comprehend a cloze passage, the Peabody Individual Achievement Subtest of Comprehension (PIAT) to assess ability to segment a reading passage into meaningful units, and the Gates-MacGinite Reading Tests, Survey F to assess speed and accuracy.

On the cloze passage Mike did well in cognitive retrieval. At the end of the testing process he could selectively segment a sentence, and select syntactic cueing to increase comprehension. Often he used the redundancies of context to monitor answers. On the Gates MacGinite Test, which measured speed and accuracy, vocabulary and comprehension, Mike performed as could be predicted. He scored well on all measures except speed and accuracy. Given a time limit, Mike is not yet ready to automatically maintain the questioning, rehearsal and "cueing systems" suggested in strategy. On the PIAT, Mike skipped over multi-syllable words, preferring to retrieve semantic meaning from his understanding of subject-verb relationship and his newly acquired knowledge of grammatical signals. Pictorial cues provided in this test reinforced symbolic decision. Miscues on passages read orally paralleled findings in assessing written language, decoding and memory for sentences.

As a result of this self acknowledging process Mike has developed "self awareness" of his strengths in deductive reasoning and his weaknesses in short-term memory. He was actively involved in a diagnostic prescriptive process that has "unmasked" his strengths and weaknesses from perception and language structure to the acknowledgment of his cognitive semantic control. Mike is now ready to incorporate higher levels of learning to process a lecture, to read a book or to write a paper. Because this "self acknowledging" testing process builds in strategy planning, Mike has de-

veloped the "inner dialogue" and self monitoring skills which he needs to select relevant, meaningful information. This will serve him best in bridging the gap from his weakness in short-term memory to his strength in long-term conceptualization. In moving Mike from the representation level of coding, to the conceptual level of meaning, the diagnostic process has achieved its goal.

5. The Prescriptive Phase

At the completion of diagnosis and the beginning of prescription, meta cognitive intent is at its peak. This encompasses three levels of awareness: awareness of self, awareness of the task, and awareness of the professor. Awareness of self provides the student with the creative force to become the "executor" of his own learning as she/he selects and adapts meaningful strategies to assist her/him in making the transition from representational learning to meaningful learning. It brings the importance of self concept and self esteen to the process of learning. Likewise, it "routes" meta cognitive terminology of self process of learning. Likewise, it "routes" meta cognitive terminology of self scanning, self monitoring, self instruction, self rehearsal, self control back to self responsibility. This is the key to successful performance at the college level. Awareness of task requires an awareness of the course syllabus to be followed, the time frame in which specific tasks are to be completed, and a clear understanding of specific assignments for which the student is responsible. It involves asking questions of planning and purpose. Brown says it so well:

1. Stop and think.
2. Do I know what I want to do?
3. Is there anything more I need to know before I can begin?
4. Is there anyting I already know that will help me?[10]

Awareness of a professor at UCB combines awareness of self and awareness of task in a triangular interaction. At UCB the diagnostic "self acknowledging" process provides the student with technical information to become the carrier of his/her own information to the professor and staff. Therefore, the program strongly recommends that the student meet with the professor and talk about lectures, readings and test expectations. At times the learning specialist and student role play and rehearse how to approach a problem. The student might say to the professor, "When I listened to your lecture on Thursday, I believe I lost the main idea. Here in my notes, I have some of the details, but I can't seem to make the whole relationship. Could you help me understand this lecture?" This tells the professor that the student is aware and is concerned about a particular task. Consequently, the professor responds with answers, warmth and concern. When a professor is given the opportunity to communicate with a student (and the student must take the initial step) the professor learns in an interactive process that a learning disabled student at the college level is highly motivated to learn, and is cognitively responsible and in control of how she/he learns. This is the positive message a professor internalizes, when the student asks for special test accommodations.

Sandy is an example of self awareness, self determination, and good self concept that makes meta cognition work in utilizing the three dimensions of awareness. Her diagnosis shows a severe visualization deficit in attending to selecting and holding visual symbols associated with language. Because of her limited visual memory, she was unable to perceive a word as a whole. Consequently, she learned how to read by a laborious process of phonetic analysis. She also had difficulty blending component parts into a whole, indicating a deficit in phonetic memory. What she routed to short-term memory was a combination of isolated words, which represented "crack-

ing the code," but not reading for meaning. Though she defined herself as an auditory learner, testing showed a reauditorization deficit in word selection and word retrieval. Testing also showed a deficiency in auditory memory span. In addition, she was unable to make sound symbol relationships, so she expressed the sophisticated vocabulary she owned when she was accountable for written expression. In contrast, observations showed that Sandy applied cognitive associative strength in building relationships by relating past experiences to present tasks. Sandy was a top down deductive learner who drew inferences but who could not integrate details. Sandy's strength was her ability to analyze and to evaluate life situations, which she brought to her learning experiences. A professional wrote about her, "If I were to teach Sandy I would consider her language blind and teach her as I might a deaf person, using signals."

Meta cognitive awareness assisted Sandy in this way. We began with Sandy's own statements of strengths: "I learn by listening," "One word reminds me of the other," and "I need to write things down." As the "executor" of her thinking processes, Sandy assisted in choosing prescription. An explicit strategy intrinsic to Sandy's learning style was modeled so Sandy could independently develop and use generalized strategies in a variety of academic settings. As one of our students said of this strategy, "The strategy has to have 'carrying power' to work."

Two areas of recontextualization of learning will be described: reading comprehension and test taking. As the process was first started, these tasks required questioning, reflection "cueing," and rehearsal to control "knowledge concerning one's own cognitive processes and product."[11]

Our first step in reading for Sandy was to postpone intensive decoding, by providing channels for informal conversation and questions concern-

ing the format and organization of the book: the title, the table of contents, the glossary, the summary, the index, the appendix, etc. Questions were modeled for Sandy such as: "What information can I accumulate in concepts and terms before I begin this intensive reading? What can I select about the format and organization of this book that will be of assistance when I forget what a word means? Can I use this 'locative' information as a cueing system when I rehearse for a test?" This preliminary process was important to provide auditory stimulation before intensive reading began.

As a result, a verbal vocabulary resource became available, and we were now ready to convert visual symbols to meaning and experience. Diagnostic data told us that besides concern for "retrieval" there was a need to reduce visual overload. As we approached the first chapter heading we returned to the table of contents to rehearse terms and phrases and to analyze the organizational sequence and order of the chapter. This was done to avoid Sandy's receiving the bombardment of visual stimuli and ideas at one given time. Sandy was asked to paraphrase headings into a question which she dictated to the reading specialist, to develop a "cue paper," much like the Cornell format. She was encouraged to list questions, terms, or phrases that would facilitate retention and recall. The reading specialist and Sandy took turns reading to each other in search of specific information. Sandy followed with a ruler for focus and sequential tracking or with her finger for kinesthetic input. Important terms, definitions, and examples were marked. The reading specialist and Sandy began to search for the following three categories of cues that signaled structure and meaning to Sandy.

1. Terms and definitions recognized or rehearsed as a result of skimming the book, or attending to the table of contents.

2. Syntactic cues: the subject and verb, the inflectional endings, and the grammatical markers that signaled subordinate clauses of condition.
3. Cue words that signaled similarity, contrast, cause and effect, or transition words such as "furthermore" for addition, "in particular" for example, "again" for emphasis, "as a result" for summary, etc.

As we learned how to analyze the semantic and syntactic cues, we formulated questions, and rehearsal and review became a habitual process. We continued to develop Sandy's strength to listen as we talked about concepts and related terms. Our goal-oriented technique was to build a visual image of a conceptual ladder. We started "top down" with broad meaning, and worked "bottom up" with specific terms and associations to give Sandy a resourceful foundation for the test-taking process.

Test-taking preparation was planned during scheduled appointments. It was the continuum and result of strategy planning and time management. It was Sandy's highest meta cognitive challenge to execute her plan to control her thinking process, to retrieve the knowledge she has acquired, coded and stored in recontextualizing learning. Sandy used four metacognitive processes, recommended by A. L. Brown, which assisted her in bringing "conscious reflection" and "self-regulatory mechanisms" to the testing process:[13]

1. She analyzed the problem.
2. She reflected upon what she knew or did not know for the solution.
3. She devised a plan to attack the problem.
4. She monitored her own progress.

Sandy analyzed the problem by predicting that she would have diffi-

culty with reading test directions and difficulty with retrieval of terms. In the discussion about recontextualizing reading, we identified her need for analyzing a sentence. As she developed more specific skills in reading, we incorporated the skill of segmentation of test questions into these three parts to chunk meaning: (1) information given, (2) conditions of information, and (3) information the professor wanted. This problem-solving approach established linguistic patterns and sequential ordering that brought selectivity and comprehension to task performance.

A multiple choice test presented a problem to Sandy because she had difficulty holding the complex form of question with a number of alternatives together, especially when only one of the alternatives fit. During test preparation, Sandy was advised to cover up the choice of answers and proceed in this manner to control visual stimuli before answering questions:

1. Segment sentence.
2. Ask questions to elicit and monitor meaning.
3. Reflect, by closing eyes to visualize cluster of associations and categories learned.

In this way, Sandy regulated visual symbolic stimuli during the test.

In writing essay exams, Sandy essentially used strategies of thinking before the production of writing. The intent to write and the formulation and organization of thought patterns always preceded her psycho motor performance. With training Sandy learned from the Cornell Note Taking Method to paraphrase information and to transform grammatical structure from declarative sentences to interrogative ones. She then was able to abstract the subject, verb, and condition from the premise of the question. She was able to rewrite the question as a kernel sentence. With the kernel sentence as a core, Sandy was able to combine and build three more related

sentences, always looking to the original question for meaningful cues. Sandy often lost the patterns of her thought, as she integrated intent to write with spelling, syntax, and psycho motor demands. Therefore, she was encouraged to stop, shut her eyes, and visually reflect and reconstruct a conceptual ladder. Her application of visual imagery cued chapter headings, sub-headings, and related words learned in test preparation, thus providing a semantic link to long-term memory. Sandy knew her limits and acknowledged what she could or could not do in a testing situation. She knew she was an auditory learner, so she often would ask for an oral examination. In this case the proctor, or learning specialist, would read the question orally, while Sandy followed visually, thus giving her multisensory input. The proctor was asked to segment questions, pause and give Sandy time to reflect, paraphrase, "think out loud," problem solve, and monitor the answer. During the exchange of questions and answers, Sandy listed cue words in a vertical list and then incorporated the words in an answer, while the examiner wrote down what she said. The examiner did not give feedback while Sandy was formulating the answer.

Test taking for Sandy, as for all learning disabled students, was not an end product but a developmental process. It involved available strategies learned in test preparation. This approach emphasized problem solving and required additional time. Therefore, it was advisable at all times for Sandy to communicate with the professor that untimed tests were needed to fairly assess her knowledge of the coursework.

Sandy achieved a 3.2 GPA during her last semester at the University of Colorado. She learned to recontextualize what she read and she developed strategies which helped her to retrieve what she had learned. She became much more aware of her own unique learning needs. She developed skills to

help her understand and analyze tasks, and she began to be aware of her professors and the way in which they thought. The degree to which Sandy internalized a meta cognitional approach was very substantial and it explained why she continued to be successful in an academic setting after leaving the University of Colorado to attend school closer to her home.

6. Results

This section addresses the evaluation of the results from the program. In order to get an idea of whether or not the program has any impact on the students served, 55 students were randomly selected for analysis. These students were divided into two groups: one group represented a category of students who were diagnosed but who chose not to follow up by receiving services under the prescription part of the program. There were 20 of these students. The second category of students represented those who participated in all the phases of the program. There were 35 of these students.

The students in the analysis represented a fairly wide age distribution. The age distribution was matched between the two groups. It was as follows: in the age group 18-21, four students were from the minimally served group and 13 from the fully served group; in the age group 22-24, 11 were minimally served and 15 fully; among those over 25, 5 were minimally served and 7 fully served.

The distribution of students by gender also represented a symmetrical relationship. In the minimally served group there were 16 males and 4 females, and in the fully served group there were 26 males and 9 females. Seventy-five percent of the first group were men and 74% of the second group were male. This ratio of men to women was consistent with what we have grown to expect in the field of learning disabilities.

Another area of interest was that of the academic status of the 55 students studied. Among those minimally served, 4 have graduated, 8 are currently enrolled in good standing at the University, 4 have withdrawn, and 4 have withdrawn failing. Among those fully served, 4 have graduated, 15 are enrolled in good standing, 2 are enrolled but have probationary status, 5 have withdrawn, and 8 have withdrawn failing. Sixty percent of the first category have either graduated or are currently enrolled at the University; 40% have withdrawn. Among the second category, the identical 60% have either graduated or are still enrolled at the University. However, 2 of the 21 in this category are on academic probation.

In order to determine if the services provided to learning disabled students had an impact, statistical analysis of the two categories was conducted using a T-test. The mean difference in academic performance measured by the student's GPA between the student's last and first semester at the University was analyzed. It was our hypothesis that learning disabled students participating in our program should show an improvement in performance over time, while those not participating in the program should show a decline. It is possible often for students entering the University to avoid difficult classes in the early stages of their college career, but sooner or later the academically challenging courses must be taken.

The minimally served students had a mean GPA during their first semester at the University of 2.42 with a standard deviation of $\pm$.62. During their last semester for which they were enrolled at the University the mean GPA was 1.98 with a standard deviation of $\pm$.69. The mean difference between the two semesters was -.52 with a standard deviation of $\pm$.78.

The students who were fully served had a mean GPA during their first semester of 2.20 with a standard deviation of $\pm$.86. During their last semester of enrollment their mean GPA was 2.38 with a standard deviation of

±.62. The mean difference between the two semesters was +.25 with a standard deviation of ±.87.

The T-test analysis showed that there was a significant difference between these two populations at the .01 level of significance. The substantial drop in level of academic performance by those students with learning disabilities who did not seek services is suggestive. As a group, they performed better during their first semester than did those students who participated in the program. However, their decline in academic performance points toward substantial difficulties which they experienced at the University. What seems to be the case is that students with learning disabilities with high performance potential may be able to successfully participate in a university program without assistance. Thus, 60% of those receiving minimal services were able to either graduate or maintain good academic standing. However, many others will fail on a grand scale. It is also likely that those students who are successful are not as successful as they would be if they were to participate in the program.

On the other hand, the students who do participate in the program are able to show steady progress and are more likely to achieve up to their potential.

While the program cannot guarantee success, it is reasonable to conclude that a group with somewhat less ability which took advantage of the services offered performed significantly better than its more naturally talented counterpart.

While there are many anecdotal examples of the way in which the program helped individual students, the statistical analysis which was conducted provides evidence that students with learning disabilities who participate in the program at the University of Colorado at Boulder have a

good chance to successfully participate in the academic program and that they can experience the personal benefits which come from growing self-esteem which is related to an improving level of academic performance.

7. Concluding Remarks

The University of Colorado at Boulder Learning Disabilities Program continues to grow. Admissions policies have been established which evaluate students with learning disabilities in a more individualized manner. Special procedures have been worked out to permit more flexibility for the learning disabled student attempting to fulfill the foreign language requirement. Linkage with other on-campus student service programs has been established. The program is experimenting with group interaction classes which involve two to three learning disabled students in a tutorial setting, and, of course, the coordination of efforts with the faculty of the University is an on-going process.

The University of Colorado at Boulder anticipates serving over 80 students with learning disabilities during the 1984-85 academic year. We believe that we have established the viability of students with learning disabilities who are qualified to complete academic work to attend our university. The success of our students has been a source of personal fulfillment and institutional pride which has generated a continuing commitment to the education of students with learning disabilities.

NOTES

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